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ZOOLOGY.

Work of Earth-worms in Yoruba Country, West Africa.

—In the Proceedings of The Royal Geographical Society, October, 1891, Mr. Alvan Millson gives the following account of the extraordinary work done by West African earth-worms.

“Northward from Ibadan, which may be described as the centre of the chief military and commercial power in Yoruba, two days journey—about forty miles—through many villages, and a landscape dotted far and near with oil-palms (*Elais guineensis*), along a road thronged with travelers, brings one to the capital of central Yoruba, Oyo (Awyaw). On leaving Ibadan I passed in the course of our morning’s march over 4700 men, women, and children, hurrying into the great city from the farm villages, with loads of maize, beans, yams, yam flour, sweet potatoes, fowls, pigs, ducks; or driving cattle, sheep, and goats; or mounted on small native horses which amble quickly along under the combined influence of an Arab ring-bit and an armed spur which leaves its traces in deep scores along the flanks of the poor animals.

“Far and wide the land has, for generations, and indeed for centuries, been cultivated by these industrious natives. The hatchet, the fire, and the hoe have removed all traces of the original forest, save indeed where a dark trail of green across the landscape shows where the valley of some narrow watercourse or larger river is hidden among trees.

“For two or three years at most the land is allowed to lie fallow, while for three or four years double or treble crops are raised with no further cultivation than an occasional scrape with a hoe, and during its fallow time no further care is taken of it than to let a rank growth of reedy grass spring up some six or eight feet in height. Among this grass can be seen the seedlings and young plants of a new forest which would rapidly take possession were the land to be permanently deserted.

“In spite of this careless and exhausting method of cultivation the crops maintain an excellent average, and the same plot of ground serves for generations to support its owners.

“The following extracts taken from notes taken at the time will serve to explain the apparently inexhaustible fertility of a soil which does not at first sight show any signs of unusual richness.

"Were one to visit Yoruba during the early part of the rainy season only, it would appear impossible to account for these facts while under our feet unnoticed was going on the ceaseless labor of the real fertilizers of the land.

"In the dry season the mystery is at once solved, and in the simplest and most unexpected manner. The whole surface of the ground among the grass is seen to be covered by serried ranks of cylindrical worm casts. These worm casts vary in height from a quarter of an inch to three inches, and exist in astonishing numbers. It is in many places impossible to press your finger upon the ground without touching one. For scores of square miles they crowd the land, closely packed, upright, and burned by the sun into rigid rolls of hardened clay. There they stand until the rains break them down into a fine powder, rich in plant food, and lending itself easily to the hoe of the farmer. Having carefully removed the worm casts of one season from two separate square feet of land at a considerable distance from one another, and chosen at random, I find the result to weigh not less than ten and three-quarters pounds in a thoroughly dry state. This gives a mean of over five pounds per square foot. Accepting this as the amount of earth brought to the surface every year by these worms, we get somewhat startling results. I may say, speaking from the result of numerous experiments, that five pounds is a very moderate yearly estimate of the work done by these busy laborers on each square foot of soil. Even at this moderate estimate, however, of the annual result of their work, we have a total of not less than 62,233 tons of subsoil brought to the surface on each square mile of cultivatable land in the Yoruba country year after year, and to the untiring labors of its earth-worms this part of West Africa owes the livelihood of its people. Where the worms do not work, the Yoruba knows that it is useless to make his farm.

"Estimating one square yard of dry earth by two feet deep as weighing half a ton, we have an annual movement of earth per square yard to the depth of two feet, amounting to not less than forty-five pounds. From this it appears that every particle of earth in each ton of soil to the depth of two feet is brought to the surface once in twenty-seven years.

"The earth-worm which produces such surprising results has been identified as a new species of *Siphonogaster*, a genus known hitherto only in the Nile Valley."

The Worm *Gymnorhynchus Reptans*.—M. Moniez has recently found a perfect specimen of *Gymnorhynchus reptans* in *Oxyrhina glauca*. This genus is distinguished from other species of Tetrarhynchides, known in the larval state, by a curious appendage at the end of the sac into which the animal can retract the anterior part of its body as in a cyst. This appendage, about one meter in length, forms a net-work in the tissues of its host, and it is extremely difficult to get the entire animal. Contrary to what has been supposed by Van Beneden, the sac into which the anterior part of the larvæ is retracted, as well as the enormous appendage do not persist in the adult animal, nor are they sexed; it is digested by the new host, and of this very long animal there remains only the neck and that small portion of the tissues attached to which the name "zone génératrice" has been given and upon which depends the formation of the chain of rings which complete the animal.

M. Moniez considers this peculiar appendage comparable with that found in several Cestodes of the type of *Tenia serrata*. (Revue Biol. Jan. 1892).

New Fishes from Chihuahua, Mexico.—During the months of July and August, 1891, some collections of fishes were made by the author at several points in Mexico, from Orizaba to Chihuahua; many interesting specimens were taken, several of which are believed to be new to science. The specimens here described were taken from the Rio de las Conchos at Chihuahua. The river bed here is half a mile wide in places, with numerous sand bars and depressions. It is little more than a river bed however, owing to the almost total lack of rainfall throughout the entire year. The water in this large river bed is reduced to a very diminutive stream that is brought from the mountains ten miles away by an aqueduct to supply the city with water.

A mile below the city the stream is dammed, in order to use the water for irrigating purposes. Here on one side the bank is high and rocky and the water is entirely too deep to be seined. The other bank is composed of sand, sloping gradually to the deeper water, and is easily accessible. The bottom is covered with several inches of mud, and in many places the shallow parts are thickly grown with various water weeds.

These quiet waters swarm with fish, for the most part of the minnow family.

At the upper end of the pond the water was shallow, clear, and in places swift enough to form ripples, here a number of Cyprinodontidæ

and two species of darters were taken, making about sixteen species in all.

Notropis chihuahua sp. nov.—Body elongate, back little elevated, rising gradually from snout to front of dorsal; head large; snout blunt; mouth nearly horizontal, slightly oblique; maxillary scarcely reaching to front of eye; eye large, averaging $3\frac{3}{4}$ mm. longer than snout, but not quite equal interorbital space; anterior part of dorsal midway between snout and caudal; scales deeper than long, not crowded anteriorly; lateral line straight, nearly every scale with a pore.

Color, light brown above; edges of scales above the lateral line with small but closely placed black dots; body also above the lateral line thickly but irregularly sprinkled with dark brown spots, these gradually becoming more numerous toward the median line of the back, where they form a vertebral line; the side of the body with a plumbous lateral stripe, of about the width of the eye; this lateral stripe can be traced through the eye and around the snout, thickly sprinkling the upper lip with small dots, but not touching the lower lip; the lateral stripe terminates in an irregular spot at base of and between the lobes of the caudal; sides below the lateral line silvery; belly, plain white. The fins are plain except the dorsal and caudal which are dusky but without distinct markings; teeth 4-4; hooked grinding surfaces very narrow.

Following are measurements of a few specimens in mm., the length being taken from snout to base of caudal fin.

| Length. | Head. | Depth. | Eye. | Lat. line. | Dorsal. | Anal. |
|---------|-------|--------|------|------------|---------|-------|
| 58 | 15 | 15— | 4 | 34 | 8 | 7 |
| 58 | 15 | 15— | 4 | 37 | | |
| 57 | 15— | 14 | 4 | 35 | | |
| 53 | 13+ | 15+ | 3.5 | 34 | | |
| 50 | 12 | 13.5 | 3.5 | 36 | | |
| 49 | 12 | 13 | 3.5 | 33 | | |
| 54 | 14 | 14 | 4— | 33 | | |
| 53 | 13+ | 14 | 4— | 35 | | |
| 51 | 13 | 14 | 3.5 | 34 | | |
| 50 | 14.5 | 13 | 3.5 | 36 | | |

Etheostoma scovellii sp. nov.—Body stout, head large, snout abruptly decurved, back but little elevated, caudal peduncle broad, spinous dorsal low. Body covered with about ten bands, $1\frac{1}{2}$ mm. wide, of a dark purplish cast, olive between; the first, second and fifth

extending over the back. Pectoral and ventral fins plain, spinous dorsal bordered with black, also an imperfect stripe close to back; soft dorsal with two imperfect dark stripes; caudal frequently barred. Mouth horizontal, lower jaw included, maxillary reaching a little back of front of orbit, nearly to edge of pupil. Lateral line incomplete, reaching to about midway of the soft dorsal.

Measurements taken as in specimens described above.

| Length. (total) | Head. | Depth. | Lat. line scales. | Dorsal rays. | Anal rays. |
|--------------------|-------|--------|----------------------|-----------------|---------------|
| 33 | 10 | 7 | 64 | XII- 9 | I-8 |
| 33 | 10 | 8 | 64 | XII-11 | I-8 |
| 33 | 10 | 7 | 64 | XII-10 | I-8 |
| 33 | 10 | 7 | 58 | XII-11 | I-8 |
| 33 | 10 | 6+ | 63 | | |
| 33 | 10 | 6 | 60 | | |
| 33 | 10 | 6+ | 63 | | |
| 30 | 10— | 5.5 | 64 | | |
| 29 | 10— | 6 | 62 | | |
| 30 | 10 | 5 | 63 | | |

—A. J. WOOLMAN, South Bend, Indiana. March, 1892.

Description of a New Mouse from Southern California.

—Seventeen specimens of a long-tailed *Vesperimus* collected at Dulzura, San Diego Co., Cal., belong to a species very different from any hitherto described. In size and general characters they agree closely with *V. eremicus*, but the color is curiously like that of *V. californicus*. The species may be known by the following characters:

Vesperimus fraterculus sp. nov. Size medium, tail decidedly longer than head and body, thinly-haired and without pencil; soles naked; ears rather large and very thinly-haired except at base and along anterior margin.

Adult male and female (♀ No. $\frac{143}{96\frac{3}{2}}$ collection of G. S. Miller, Jr., Dulzura, San Diego Co., Cal., January 7, 1892. Charles H. Marsh, collection ♂ No. $\frac{121}{104\frac{1}{4}}$ same locality and collector, January 15, 1892); fur everywhere, except in region of mouth, slaty plumbeous at base; ventral surface dirty yellowish-white, becoming purer on throat and chin; a distinct fulvous pectoral spot; sides with a clear fulvous stripe extending from region of eyes to base of tail, under which the stripes of the two sides meet; this fulvous area almost entirely without black-tipped hairs and sharply defined against the color of the

belly, but shading insensibly into that of the back; dorsally yellowish wood-brown, becoming grayish between the ears and over the head and muzzle, everywhere much intermixed with black-tipped hairs, which produce a decided blackish shade throughout the region from shoulders to base of tail and well down over the sides; a narrow dusky ring around eye; tail brownish, slightly paler ventrally, without distinct line of demarkation; whiskers reaching about to shoulders, mixed dark-brown and silvery gray; dorsum of manus and pes white; color of sides extending about to wrists and ankles, which latter are dusky in front.

Measurements taken from the fresh specimens by the collector:

| No. | Sex. | Date. | Length. | Tail vertebræ. | Hind foot. | Ear from notch. |
|---------------------|------|--------------|---------|-------------------|---------------|--------------------|
| $\frac{1217}{1644}$ | ♂ | Jan. 15, '92 | 185 | 113 | 20 | 18 ¹ |
| $\frac{1093}{924}$ | ♂ | Nov. 23, '91 | 185 | 102 | 20 | 16 |
| $\frac{1096}{927}$ | ♂ | Nov. 28, '91 | 167 | 90 | 20 | 16 |
| $\frac{1097}{928}$ | ♂ | Dec. 1, '91 | 200 | 118 | 22 | 18 |
| $\frac{1099}{930}$ | ♂ | Dec. 10, '91 | 170 | 90 | 18 | 15 |
| $\frac{1132}{936}$ | ♂ | Dec. 26, '91 | 173 | 100 | 20 | 16 |
| $\frac{1133}{960}$ | ♂ | Jan. 6, '92 | 150 | 78 | 20 | 15 |
| $\frac{1134}{961}$ | ♂ | Jan. 7, '92 | 180 | 103 | 20 | 18 |
| $\frac{1136}{963}$ | ♂ | Jan. 8, '92 | 182 | 102 | 20 | 15 |
| $\frac{1095}{926}$ | ♀ | Nov. 21, '91 | 188 | 105 | 20 | 16 |
| $\frac{1098}{929}$ | ♀ | Dec. 8, '91 | 200 | 113 | 22 | 16 |
| $\frac{1135}{962}$ | ♀ | Jan. 7, '92 | 192 | 110 | 20 | 15 ¹ |
| $\frac{1137}{964}$ | ♀ | Jan. 12, '92 | 185 | 105 | 20 | — |

It will be seen that *Vesperimus fraterculus* agrees very closely in size with *V. eremicus*.² The very much darker color of the former will, however, serve to distinguish the two species at a glance.

The series show but little individual variation in color. The coloring of the dorsal surface is remarkably constant, the variation among the adults being practically confined to the amount of shading produced by the black-tipped hairs. They are tolerably evenly distributed and do not tend to form a dark dorsal streak. Three specimens younger than the rest are grayer, but have the fulvous lateral stripe nearly as well developed as the adults. The dirty yellowish white

¹Type.

² See table of measurements given by Dr. C. Hart Merriam, North American Fauna, No. 3, 63.

tinge on the belly is more pronounced in some specimens than in others, and in most there is a tendency for the fur in the region of the anus and genital organs to become pure white. The fulvous pectoral spot is absent in two specimens, and in the others varies from a mere trace to an irregular stripe 25 mm. long and about one third as broad in the widest part. The dusky mark at the ankle is conspicuous in some individuals and nearly absent in others.

The skull of *Vesperimus fraterculus* resembles so closely that of *V. eremicus* that I can find no character by which to distinguish them. The number of specimens of *eremicus* at my disposal is, however, too limited to furnish satisfactory data. As compared with skulls of *V. americanus*, those of *V. fraterculus* average shorter, with brain case of about equal width and rather flatter. The nasals end in an obtuse angle about 1 mm. short of the premaxillaries. They are narrower than in *americanus*. The incisive foramina extend about to first third of anterior molar. The articular process of the mandible is shorter, and the coronoid occupies a more posterior position. The posterior upper molar is relatively smaller than in *americanus*. The following are some cranial measurements of seven specimens of *V. fraterculus*.

| Number..... | ⁹²⁷ 1096 | ⁹³⁰ 1099 | ⁹⁵⁹ 1132 | ⁹⁶⁰ 1133 | ⁹²⁹ 1098 | ⁹⁶² 1135 | ⁹⁶⁴ 1137 |
|---|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Sex..... | ♂ | ♂ | ♂ | ♂ | ♀ | ♀ | ♀ |
| Basilar length..... | 21.4 | 19 | 19.8 | 19 | 21 | 20.6 | 20.8 |
| Basilar length of Hensel | 19 | 17 | 17.6 | 16.4 | 18.8 | 18 | 18.4 |
| Zygomatic breadth..... | 12.6 | 12 | 11.8 | 11.4 | — | 12 | 12.6 |
| Interorbital constriction..... | 4 | 4 | 4 | 3.8 | 4 | 3.8 | 3.6 |
| Greatest length of nasals..... | 9.6 | 8.6 | 8.4 | 8.2 | 9 | 8.6 | 8.4 |
| Incisor to molar (alveolæ)..... | 6 | 5.2 | 5.4 | 5.4 | 6 | 5.8 | 6 |
| Incisor to postpalatal notch..... | 10.2 | 8.2 | 8.8 | 9 | 9.2 | 9.8 | 9.2 |
| Height of crown from inferior lip of foramen magnum..... | 7.6 | 7 | 7 | 7 | 7 | 6.8 | 7.4 |
| Length of upper molar series along crowns. | 3.8 | 3.8 | 3.6 | 3.6 | 3.4 | 3.6 | 3.6 |
| Length of mandible, exclusive of incisors..... | 13.2 | 11.5 | 12.6 | 12.4 | 13 | 13 | 13.2 |
| Length of lower molar series along crowns..... | 4 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 | 3.6 |

—GERRIT S. MILLER, JR., Cambridge, Mass. February, 1892.

Zoological News.—A list of a single day's dredging at Port Jackson, N. S. Wales, shows 106 mollusca and sixty-one general invertebrata exclusive of mollusca. Among the crustacea was that rare and interesting species, *Dromia sculpta* Haswell. The specimens obtained enabled Mr. Thomas Whitelegge to settle the question regarding the identity of *Cryptodromia nodulifera* Henderson, described in vol. xxvii. of the Challenger Report with *Dromia sculpta* Haswell. He sees no valid reason why they should be regarded as distinct. (Records Aust. Mus, vol. i., No. 4.) —The Entomostracans recently collected in Russia and Siberia by M. Charles Rabot include nineteen species of Copepods and twenty-seven Cladocera. Although none of them are new to science they are of interest since they are the first reported from that region; and also they afford another proof of the wide geographical distribution of European species. (Bull. Soc. Zool. 1891.) —A new species of Tortricidæ, *Palæobia longistriata*, from N. S. Wales has been described by J. H. Durrant. This species agrees in nervation and structure with the typical forms, but can hardly be said to have the apex of the forewings produced. (Proceeds. Linn. Soc., N. S. W., vol. vi.)